

Listing of Claims:

This listing of Claims will replace all prior versions, and listings, of claims in the application:

1. (Previously Presented) A battery management system for managing a string of cells including a sensing module; a DC/DC converter; a control module coupled to the sensing module and the DC/DC converter; and a common line coupled to both the sensing module and the DC/DC converter and adapted for connection to a battery when in use, wherein the sensing module is configured to receive battery information from the common line and output a sensing signal to the control module in accordance with the battery information, wherein the control module is configured to receive the sensing signal from the sensing module and output a control signal in accordance with the battery information, and wherein the DC/DC converter has a first port configured to be coupled across a plurality of cells of the string and a second port coupled to the common line, the DC/DC converter operative to transfer energy between the first and second ports to feed and/or drain a battery connected to the common line when in use in accordance with the control signal.
2. (Previously Presented) A system according to claim 1 including a multiplexer for selectively connecting a plurality of batteries to the common line.
3. (Currently Amended) A battery management system for managing a string of cells including a sensing module; a DC/DC converter; and a control module coupled to the sensing module and the DC/DC converter; wherein the sensing module is configured to receive battery information from a common line and output a sensing signal to the control module in accordance with the battery information, wherein the control module is configured to receive the sensing signal from the sensing module and output a control signal in accordance with the battery information, wherein the DC/DC converter has a first port configured to be coupled across a plurality of cells of the string and a second port coupled to the common line, the DC/DC converter operative to transfer energy between the first and second ports to feed and/or drain a battery connected to the DC/DC converter when in use in accordance with the control signal in order to perform equalisation of [[a]] the string of

serially connected batteries, and wherein the control module is configured to perform one or more additional battery monitoring or management tasks.

4. (Original) A system according to claim 3 wherein the one or more additional battery monitoring or management tasks include impedance testing.

5. (Previously Presented) A system according to claim 3 wherein the one or more additional battery monitoring or management tasks include capacity testing.

6. (Previously Presented) A system according to claim 1 wherein the sensing module, DC/DC converter and control modules are enclosed in a battery compartment.

7. (Previously Presented) A system according to claim 1 including a multiplexer for selectively connecting a plurality of batteries to the sensing module and/or the DC/DC module.

8. (Original) A battery management apparatus for managing a substring of cells in a string of cells, the apparatus comprising:

a DC bus;

a multiplexer/demultiplexer circuit operative to selectively couple nodes of the substring of cells to the DC bus;

a DC/DC converter circuit having a first port configured to be coupled across a plurality of cells of the string and a second port coupled to the DC bus, the DC/DC converter operative to transfer energy between the first and second ports;

a sensor circuit coupled to the DC bus; and

a controller circuit configured to connect to a communications bus and operatively associated with the multiplexer/demultiplexer circuit, the DC/DC converter and the sensor circuit.

9. (Original) An apparatus according to Claim 8, further comprising a ground bus, wherein the multiplexer/demultiplexer circuit is operative to selectively connect the nodes to the DC bus and the ground bus, and wherein the second port of the DC/DC converter circuit is coupled to the DC bus and the ground bus.

10. (Original) An apparatus according to Claim 9, wherein the first and second ports of the DC/DC converter circuit are isolated from one another.

11. (Original) An apparatus according to Claim 9, wherein the DC/DC converter circuit further comprises a third port and is operative to transfer energy between the first and third ports, and wherein at least one of the controller circuit, the multiplexer/demultiplexer circuit and the sensor circuit are configured to be powered from the third port.

12. (Original) An apparatus according to Claim 11, wherein the DC/DC converter circuit further comprises a fourth port configured to be coupled to a power supply bus associated with the communications bus and is operative to transfer energy between the fourth port and the third port to power to at least one of the controller circuit, the multiplexer/demultiplexer circuit and the sensor circuit.

13. (Original) An apparatus according to Claim 9, wherein the controller circuit is operative to cause the multiplexer/demultiplexer circuit to couple the DC bus and the ground bus to respective selected first and second nodes of the substring of cells, to cause the sensor circuit to sense a voltage between the DC bus and the ground bus and to cause the DC/DC converter circuit to transfer energy between the selected first and second nodes and the plurality of cells of the strings responsive to the sensed voltage.

14. (Original) An apparatus according to Claim 9, wherein the controller circuit is operative to adjust the cells of the string by causing the multiplexer/demultiplexer circuit and the DC/DC converter circuit to transfer energy between at least one cell of the substring and the plurality of cells.

15. (Original) An apparatus according to Claim 9, wherein the controller circuit is operative to cause the multiplexer/demultiplexer circuit to couple the DC bus and the ground bus to respective selected first and second nodes of the substring of cells, to cause the DC/DC converter circuit to transfer energy between the selected first and second nodes and the plurality of cells of the strings responsive to the sensed voltage, to cause the sensor circuit to sense a voltage between the DC bus and the ground bus and/or a current at the DC bus responsive to the transfer of energy.

16. (Original) An apparatus according to Claim 15, wherein the controller circuit is further operative to determine a status of at least one cell of the substring responsive to the sensed voltage and/or current.

17. (Original) An apparatus according to Claim 15, wherein the controller circuit is operative to transmit battery information over the communications bus responsive to the sensed voltage.

18. (Original) An apparatus according to Claim 9, wherein the controller circuit is operative to cause the multiplexer/demultiplexer circuit and the DC/DC converter circuit to load at least one cell of the substring while causing the sensor circuit to generate test data for the loaded at least one cell.

19. (Original) An apparatus according to Claim 18, wherein controller circuit is further operative to process the generated test data to determine a status of the at least one cell.

20. (Original) An apparatus according to Claim 19, wherein the controller circuit is operative to generate at least one of an estimate of capacity and an estimate of reserve life from the generated test data.

21. (Original) An apparatus according to Claim 20, wherein the controller circuit is operative to transmit the at least one of an estimate of capacity and an estimate of reserve life over the communications bus.

22. (Original) An apparatus according to Claim 18, wherein the controller circuit is further operative to transmit cell information on the communications bus responsive to the generated test data.

23. (Original) An apparatus according to Claim 8, wherein the sensor circuit comprises an analog to digital (A/D) converter circuit operative to generate a digital value representative of a voltage at the DC bus and wherein the controller circuit is operative to receive the digital value.

24. (Original) An apparatus according to Claim 8:

wherein the sensor circuit comprises:

a current sensor operative to generate a voltage responsive to a current in the DC bus; and

an A/D converter circuit coupled to the current sensor and operative to generate a digital value representative of the voltage generated by the current sensor; and

wherein the controller circuit is operative to receive the digital value.

25. (Original) A plurality of battery management apparatus according to Claim 8, respective ones of which are connected to respective substrings of the string of serially-connected cells, wherein the controller circuits of the plurality of battery management apparatus are coupled to the same communications bus.

26. (Previously Presented) A system according to claim 3 wherein the sensing module, DC/DC converter and control modules are enclosed in a battery compartment.

27. (Previously Presented) A system according to claim 3 including a multiplexer for selectively connecting a plurality of batteries to the sensing module and/or the DC/DC converter.